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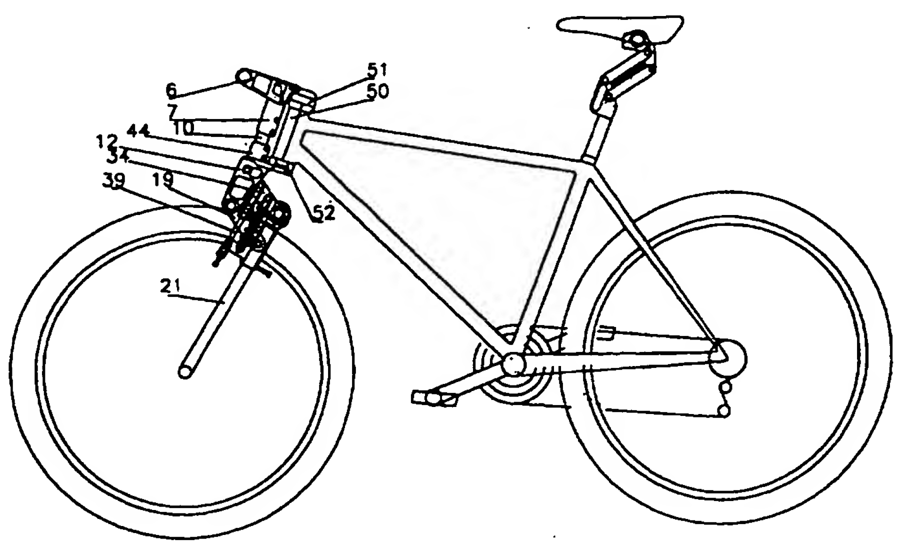

(57) Abstract

A suspension fork assembly, as replacement for a standard bicycle front fork, comprises a support structure (7, 10, 44) which is fitted to be headset bearings (51, 52), in front of and parallel to the head tube (50) of the bicycle frame. The fork legs (21) of the assembly is connected to the support structure via three parallel and moveable linkage members (19, 34), of which one (34) is located centrally and above the bicycle front wheel. Spring and damper mechanisms (39, 41) are mounted between the central linkage member (34) and the fork legs (21).

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A SPRINGY FORK ASSEMBLY FOR A TWO-WHEELED VEHICLE

This invention relates to a suspension system for the front fork of a two-wheeled vehicle, most commonly a bicycle, and more precisely to a suspended front fork assembly intended for installation on a standard bicycle at a position in the bicycle frame where a suspended or non-suspended fork normally is attached to the head tube. The fork assembly can be installed to the bicycle's head tube with interchangeable bushings and adapters, so that it can be installed no matter what the dimension or existing means of attachment to the head tube are. The invention includes an adjustable external member which is outside the head tube, so the fork has no tube which must be passed up through the frame's head tube, something that normally necessitates cutting off the tube for adaptation to the bicycle.

There are a number of existing prior art suspension designs for a bicycle front fork. The most common is the device with telescopic joint action in both fork legs. The prior art also comprises a design which is stated in US patent no. 5,462,302 where both legs of the fork are supported in a parallelogram which is oriented forward relative to a normal type of fork. Such a design will not provide any «anti-dive» feature. This means that under braking the suspension-system is activated causing the front end of the bicycle to dive forwards and downwards. This is not desirable. The same construction is also known to break under pressure from the side. There also exist prior art variants having hinged double fork legs, compare US-A-5,431,426, US-A-4,421,337, DE-A-38 33 880 and DE-A-39 29 812. These designs normally have high friction under the transfer of forces to the springy medium. The prior art also includes various complicated linkage designs, often in connection with motorcycle forks. Examples are EP-A-30,306 , 32,170 and 10,426. These solutions will normally be poorly suited to bicycles.

From EP-A$_2$-493,773, we are familiar with a suspension front fork where a linkage arranged in a parallelogram form, with stays angled diagonally downwards and backwards while connected to a coil spring, result in a suspension and damping mechanism. However, this mechanism, which is not very clearly

described in the document, either provides too small a range of fork travel, or is structurally weak regarding torsional forces. In addition, it is unclear how the suspension means can work as intended. The device according to that document, is also dependent on having a tube which, as is common, must go down through the head tube and be connected to the headset bearings in order to constitute a basis for a fork holder part to which the parallel stays can be journalled. This type of fork assembly is accordingly more of an assembly which must be considered to be an integral part of the bicycle, whereas the present invention relates to a typical replacement part which can be attached to a standard bicycle to replace a bicycle's normal fork system (as well as its handlebar stem, including a stem projection).

The fork assembly of the present invention has none of the aforementioned negative characteristics, and is intended to be adaptable to any bicycle (or two-wheeled vehicle). The invention provides a fork assembly with excellent strength and stability, and it gives good potential for travel of the front wheel up towards the frame of the bicycle.

The invention concerns a suspension fork assembly for a two wheeled vehicle, preferably a bicycle, intended for installation on a standard head tube; said assembly comprising an upper fork holder, two downward extruding fork legs as well as a movable mid-section which comprises substantially parallel linkage members, angled down and backwards, each being pivotally journalled in its upper end to the fork holder, and in the lower end to the fork legs, as well as springing and damping mechanisms.

This fork assembly is distinctive in that

- the fork holder encompasses an externally mountable support structure in front of and mostly parallel to the head tube, attachable to the head tube by means of rotatable bearings in the upper and lower ends of the head tube, and in that
- the linkage members include

one upper linkage member positioned centered substantially directly over the bicycle front wheel and supported by horizontal axles in the fork holder and in the upper part of the fork legs, respectively, and,

two lower linkage members positioned outside relative to the front wheel and supported substantially by the fork legs somewhat below the support axle of the upper linkage member.

More detailed embodiments of the fork assembly of the invention appear from the appended dependent claims attached to independent patent claim 1 which defines the invention in its widest scope.

In a situation in which a bicycle's front wheel hits a bump and simultaneously braking is going on, most of the previously known suspension fork assemblies will compress the spring medium by transferring forces from the braking of the mass (bicycle + cyclist) to the spring medium in the fork-legs. In addition, the rotation of the wheel will drag the fork legs along with it, to a degree allowed by the friction of the brake-pads. These effects will lead to a compression of the spring medium if it is fitted in connection with e.g. a parallelogram linked like in US-A-5,462,302 referred to above, and when the spring medium is compressed, it will be less able to absorb energy from the impact associated with the bump.

In the present invention, the aforementioned problem is solved by having the stays or linkage members, which connect the fork-holder (upper portion of the assembly) to the fork bridge, oriented diagonally downwards and backwards relative to the direction of the bicycle movement. Upon braking, the brake pads (or the disc brake) try to push the fork forward with the rotation of the wheel, forces will then attack the stays/linkage members and attempt to force them back to their initial position (i.e. an unstressed position). These forces act together with the spring medium, which already when the bicyclist mounts the bicycle, is pressed somewhat down to a balance position which can be chosen by means of a bias of a suitable type. The significance of this is that a braking entails that the spring medium, to a greater degree than when not braking, is ready to absorb the impact of bumps during braking. Thus, the invention provides an "anti-dive" feature.

The space that a parallelogram linkage construction takes up under the bicycle frame has also previously been a problem. The more space taken up by the assembly, the more a bicycle frame geometry must be changed, and thereby

the total riding characteristics of the bicycle are also changed. In practice this means that bicycle frames must be custom built to accommodate fork assemblies in which this problem is not solved.

The problem is solved in accordance with the present invention with the help of an upper and central (parallelogram) stay or linkage member, where the linkage member supports and the linkage member itself are able to absorb all torsional forces occurring. The lower linkage members are divided in two separate stays, with each placed on respective sides of the front wheel. The "parallelogram" consists therefore of three separate stays/linkage members. This enables the assembly to be compact, to be very stable, there will be less play in the movable system, and possible necessary maintenance and part replacement can be done simply and inexpensively.

With a fork assembly in accordance with the invention it will not be necessary to saw off a tube which shall be passed up into the frame head tube under installation, to be adapted to the head tube length. Instead, the fork assembly features a stable, external structure, hereafter called a "fork holder", which is located in front of the frame head tube and is attached in such a way that length adjustment can be done by mutual adjustment of three main parts. These three main parts are a stiff main tube and two clamp attachment parts which can be screwed/tightened outside of the main tube in freely selectable positions. Further, the lower clamp attachment part is integral with a fork crown which has downward oriented side pieces to which the linkage members are attached. A member for fastening to the lower headset bearing also protrudes (or rather sticks out backwards) from the lower clamp attachment part/fork crown. The upper clamp attachment part comprises in a similar manner a part which is attachable to the upper headset bearing. Exact adjustment of the length of the fork holder is done with normal tightening of the upper bicycle headset bearing.

A problem with previously known suspension forks has been that they raise the bicycle level a certain number of mm from the ground, normally about 50 mm. This results in that the bicycle handlebar is also raised by 50 mm. To compensate for this change in height, it is necessary to install a new handlebar stem/stem projection. This makes installation more complicated as well as more expensive.

In the present invention this problem is solved by, in connection with the fork holder of the fork assembly, i.e. the structural member external to the frame head tube, mounting and designing a handlebar stem projection which can be fastened and adjusted in freely selectable angels and extensions, as measured from the center of the upper headset bearing. With such an adjustability, it is possible to achieve adaptation to every bicyclist.

Another known problem with suspension forks is the return damping, where constant friction causes the systems not to work well when small bumps are encountered. According to an advantageous embodiment of the invention, this problem is solved by the installation of a damping system which enables fine-tuning of ranges with on average no friction. The damping system may e.g. be fitted parallel to the spring mechanism. This component can be positioned wherever there is space and movement between two parts of the assembly when absorbing a shock:

In a situation in which the front wheel of the bicycle is impacted by a bump, the damping system will attempt to store the energy from the impact in the spring medium by means of a transfer that is as frictionless as is possible. Here, especially the size of the initial forces is decisive as to whether this function will be well taken care of or not. Thereafter it is necessary to suppress the rebound action from a spring medium which has absorbed a relatively high amount of potential energy. On currently used designs, this return damping function is performed by oil dampers. The disadvantage of this is, however, that the friction in the damper is also present when encountering small bumps (in addition, oil may leak from the system).

The friction of the damper will exceed the forces that the system is exposed to by the small bumps, and thereby the front wheel can not keep up with the contours of the small bumps. In the preferred embodiment of the present invention, this problem is solved by the fact that the friction in the actual support for the fork legs is quite low, and that the damper medium is adjustable to have a range in which there is no friction, and this range is adjusted to be suitable for small bumps. When the bumps exceed a certain size, the damper function will be activated. The damper is designed in such a manner that the pre-adjusted

frictionless range will always be located in the average activity range. The adjustment of the frictionless range can be made with separate adjustment screws. An option will also exist with two damper units, so that it will be possible to set two different ranges of frictionless travel. This means that the degree of friction can be increased significantly in the damper mechanism having a large frictionless range, which translates into having good control of the rebound motion on large bumps at high speeds as well. It will also be possible to mount different springs on the two sides of the wheel to make possible a very fine tuning of the ride. It will also be possible to use progressive springs in the cases where special spring-characteristics are desirable (e.g. in downhill riding).

In one embodiment of the invention, the degree of friction in the damper system can be adjustable.

The advantages of the invention may be better understood by referring to the following description of one embodiment of the invention, when taken in conjunction with the accompanying drawings, in which

fig. 1 is a side view of a bicycle, showing a front fork assembly installed on the bicycle and in an un-loaded state, in cross section,

fig. 2 is a side view of the same bicycle and the same front fork assembly in a depressed position, but in a simplified form, i.e. without the spring and damper mechanisms,

fig. 3 shows as embodiment of the damper mechanism, enlarged and in longitudinal section,

fig. 4 shows a preferred embodiment of the assembly in a side view and a front view, and

fig. 5 is a perspective view of an alternative embodiment of the assembly of the invention, in a simplified form without spring and damper mechanisms.

Fig. 1 is a side view of a bicycle, and illustrates a preferred embodiment of the front fork assembly installed on the bicycle. In addition, the bicycle has full suspension features in that it has a suspension seat-post. This suspension seat-post constitutes however, no part of the present invention. Attached to the bicycle headset bearings 51 and 52, which are located respectively at the upper and lower ends of the head tube 50, is an upper fork hold r which is composed of a

main tube 10 and two xternal clamp attachment parts 7 and 44. At the top of the clamp attachment part 7 is located a handlebar stem projection 6 which projects forwards, as well as attachment details to headset bearing 51, which details will be described below. The lower clamp attachment part 44 is integral with a fork crown 12 which also comprises a backward pointed fastening part to the lower headset bearing 52. The fork crown 12 has downward pointing sections to either side of and above the bicycle front wheel, and two lower stays/linkage members 19, i.e. one to each side, are journalled to those downward pointing sections. Higher up and substantially parallel to the lower linkage members 19, a wide, upper linkage member 34 is installed. The upper linkage member 34 is at its opposite end supported in the upper part of a fork bridge to be described below, and the fork legs 21 point downwards from the fork bridge and are fastened to the front wheel hub. Also the lower linkage members 19 are journalled to the fork bridge. It must also be stated that the fork bridge is not an essential characteristic of the invention, the very support member (i.e. a solid, strong and wide axle bolt) for the upper linkage member 34 may provide the fork bridge function, refer to the embodiment shown in figure 5.

A spring device and a damper device 39 are also illustrated in fig. 1, the details of which will be described below.

Fig. 4 illustrates the fork assembly isolated in a side view and a front view. The illustration on the left, which shows the assembly from the side, corresponds to the situation in fig. 1 but shows the fork assembly in isolation.

The details included hereafter, will be addressed mainly in relation to their location on the assembly from top to bottom. Accordingly, at the top of the assembly there is a handlebar stem projection, which in a preferred embodiment of the invention is attached to the external holder 7 (also described as a clamp attachment part 7). The handlebar stem 6 is adjustable in that a clamping screw or a quick-connector 5 through an opening 24 in the stem projection can clamp the projection 6 tight to the holder 7 in a chosen position, with an angle adjustable relative to the clamp attachment part 7. A larger opening 25 in the upper part of the holder 7 provides the possibility of choice of position. The handlebar is fastened in the opening 1, and in order to clamp the handlebar in a fixed position,

one tightens a screw 2 against a counterpart 31. Reference numeral 8 designates an upper fastening part to the headset bearing 51, and reference numeral 26 designates a threaded part allowing attachment. The upper fastening part 8 is integral with the clamp attachment part 7. By means of a fastening screw or a quick-connector 3 in an elongate slot 4 on the handlebar stem 6, it is ensured that the desired positioning of the handlebar stem is maintained. With the use of the above mentioned devices, a quick and simple way is achieved for adjusting the bicycle handlebar to an optimal position.

One of the most important characteristics of the invention is constituted by the external structure which mainly is composed of the main-tube 10 and the two clamp attachment parts 7 and 44. The upper clamp attachment part 7 is in the illustrated embodiment equipped with a cut in its back portion and clamp screws 9 for fixation to the main-tube 10 in adjustable positions. Correspondingly, the lower clamp attachment part 44 is fastened by means of a cut and clamp screws 11. The clamp attachment part 44 is also integral with the fork crown 12 there-below, which fork crown has an extension 23 pointing backwards to constitute a lower fastening part, i.e. for connection to the lower headset bearing 52. The external, forward structure provides good stability in its connection of the assembly to the bicycle head tube, i.e. a stability equal to that found in normal forks with a tube going through the frame head tube in the ordinary manner. The assembly is provided with the correct dimension relative to the length of the head tube by adjusting the clamp attachment parts 7 and 44, and fine-tuning can be accomplished by tightening the headset bearings 51,52. (As an alternative to the cut and clamp screw solution for the lower clamp attachment part 44, a threaded part for screwing the main tube 10 fixedly onto the fork crown, can be mentioned. (Such an embodiment is illustrated in fig. 5.)

In the illustration to the right in fig. 4, one sees that the fork crown 12 branches in two directions downwards. The movable linkage members 19, 34 found in the illustrated embodiment are mainly located between the two branches of the fork crown 12. The upper linkage member 34 has a wide shape and is supported by means of a wide axle bolt 35 which in turn is secured in beds 38 situated far apart from each other, and thereby an excellent rigidity in relation to

torsion is provided. The lower end 42 of linkage member 34 is, in the same way as the upper end 40, supported on a wide basis by a support bolt 36 in the fork bridge, which is referred to by numeral 27. Thus, the support bolt 36 is fixed in beds 37 which are relatively distant from each other, approximately the distance between the fork legs.

The downward pointing branches or side attachments 43 of the fork crown 2 also serve to provide attachment for the lower linkage members 19. These linkage members are journalled in upper bearings 14, and in their lower end in bearings 17 on the outside of the fork bridge 27. All three linkage members 19, 34 are angled downwards and backwards with the point of reference being the support position in the fork crown 12 and relative to the direction of the bicycle movement. Preferably, the upper and lower linkage members will be of unequal length, the lower linkage members may e.g. be slightly shorter than the upper linkage member, such as illustrated in fig. 4. The lower linkage members are preferably placed approximately at the same height as the tire of the front wheel.

The lower support bolt 42 for the upper linkage member 34 may e.g. be affixed by means of umbraco screws. The two lower linkage members 19 are attached to the fork bridge 27 at its downward directed extremities where the fork legs 21 themselves are connected. The external journalling of the lower linkage members 19 to the fork bridge 27 is by means of a bolt through the fork bridge 27 and the fork leg 21.

The construction with double lower linkage members 19, which absorb forces along the longitudinal axis of the bicycle, as well as an upper, torsionally rigid linkage member 34 with stable supports 35, 36 which absorb all torsional forces, is a very favorable design.

Detail 20 is a tab intended for the attachment of a rim brake. It is advantageous that the brake is installed on the back side of the fork, as this provides a more even wear of the brake pads and better braking.

Fig. 2 illustrates a situation where an impact to the front-wheel has caused the linkage members 19 and 34 to swing upwards and backwards around their pivot supports in the fork crown 12. For the sake of simplicity, the spring device

and the damper device ar not illustrated in this figure, which is also without reference numerals.

If, as mentioned above, the lower pair of linkage members are shorter than the upper linkage member, an impact to the front-wheel, i.e. to the hub attachment point 22 at the lower end of the fork legs 21, will cause the hub attachment point to move less backwards than the backward travel of support bearing 36. Since the lower linkage member pair is shorter than the upper linkage member, the fork legs 21 and the hub attachment point 22 will rotate forward under compression of the assembly. The fork hub attachment point 22 will then move in an arc which deviates only little from a straight line parallel to an imaginary line in extension of the bicycle head tube 50. (The distance between the two parallel lines mentioned, is referred to as «rake».)

Generally a suspension mechanism must be placed between two parts which move in relation to each other, and in the embodiment illustrated in fig. 4, an effective placement is chosen by attaching a coil spring device 41 to the upper linkage member 34 at a support point 18, and by using a support point 32 on a tab in the lower part of the fork bridge 27. The spring device 41 is then located inside the lower linkage member 19. This also applies to a return damping device 39 which is placed parallel to the spring device 41, and attached correspondingly to a support point 15 of the upper linkage member 34, and in support point 33 on the same tab on the fork bridge 27 to which the spring device is attached. Spring and damper mechanisms 41, 39 can be provided on both sides of the wheel.

The distance between the support points 32, 33 down on the fork bridge 27 and the support points on the upper linkage member 34 will decrease when the fork legs 21 are impacted by forces from below via the hub attachment point 22, and this will cause absorption and damping of the energy indused by a bump.

In fig. 5, a somewhat different embodiment of the front fork assembly in accordance with the invention is illustrated. In this embodiment, the fork bridge is replaced by a solid support bolt which connects the fork legs and also serves as a lower support for the upper linkage member. The fork crown is primarily constructed of bent sheet material, with openings/holes taken out to decrease construction weight. The fork crown thereby has an inner and an outer portion, and the lower

linkage members are journalled at their upper end between downward pointing side portions of the inner and upper parts of the fork crown. The wide upper linkage member is journalled at its top between the inner portions of the fork crown. The upper (outer) sheet portion of the fork crown continues backwards to constitute an attachment part to the lower headset bearing on the frame head tube. A nut-like fixing means replaces in this case the lower clamp attachment part 44 in fig. 1 and fig. 4.

With reference to fig. 3, a favourable embodiment of a return damping device, compare reference numeral 39 in fig. 4, will now be more closely examined. This damping device consists mainly of two telescopic parts 56 and 62, where part 62 has an internal friction/damping medium which counteracts the movement of the internal part 56. The outer part 62 is mounted in connection with a support 15 on the upper linkage member 34 as illustrated in fig. 4.

Upon compression of the spring mechanisms 41 on each side of the upper linkage member 34, the distance between support points 32, 33 down on the fork bridge 27 and the upper linkage member 34 will decrease. As a consequence of such a compression, the sleeve part 62 will be pressed down on the piston rod 56. Hence, upon the subsequent rebound motion of the assembly, the support bolt 33 on the tab of the fork bridge 27 will be able to move a short distance in an oblong opening 57 without any friction effect acting. The length of the free travel can be pre-determined by the use of a screw in the end of the piston rod 56, as the end of the screw 58 can be shifted upwards and effectively make the oblong opening 57 shorter when the screw head 59 is operated. If it is desirable to have ranges without friction/damping, which for example could be appropriate to pass smaller bumps which thereby would activate the suspension assembly freely, this is achieved by choosing a certain effective length of the oblong opening 57 by adjusting the screw head 59. In such a manner there is achieved a freely selectable, frictionless travel within an «average range of activity», and small movements can be carried out around a middle range of activity, while larger amplitudes will be subject to friction and thereby damping. The same function could possibly be applied to the damping device mounted on the opposite side, however by subjecting the end phase of movements in larger bumps, to friction

and damping. This can be effected by adjusting the free range of travel in the oblong opening to be larger.

In fig. 3, an example of an embodiment of the friction device inside the sleeve 62 is also illustrated. A friction casing 54, made for example of Teflon, engages the piston rod 56 directly, and is subject to wear. Directly outside the friction casing 54 is a surrounding casing made of a springy material such as e.g. rubber or neoprene. Tightening/adjustment of the friction can be effected since two of the parts, 54 and 55 are conical, as shown in the figure, and since they are surrounded by a tightening casing 53 which is threaded so that it can be screwed to cause the springy casing 55 to tighten against the friction casing 54. A certain amount of automatic self-adjustment is effected by the springy casing 55 itself, so that it will not be necessary to tighten the friction amount to often thereafter.

Alternatively, the sleeve part 62 can of course just as well comprise an oil damper of a type which is known per se.

As an alternative to the screw having a head 59 and a tip 58, there may be arranged e.g. a threaded external casing over the oblong opening section farthest down on the piston rod 56, with the same limiting function as the screw 58, 59 illustrated.

Damper and spring mechanisms are installed in pairs on both sides of the fork assembly for joint action e.g. in the case of large bumps. A flexible spring characteristic can also be achieved by utilizing different springs on each side, dependent also on the bicyclist's weight and cycling style.

It is advantageous if the bolt 33 is surrounded by e.g. neoprene to make the impact against the ends of the oblong opening softer.

It must finally be noted that in fig, 4 the lower linkage member 19 is shown as a transparent element, both spring and damper mechanisms are located on the inside of the lower linkage member.

PATENT CLAIMS

1. A suspension fork assembly for a two wheeled vehicle, preferably a bicycle, intended for installation on a standard head tube (50); said assembly comprising an upper fork holder (7, 10, 44), two downward extruding fork legs (21) as well as a movable mid-section (13, 14, 16, 17, 19, 34) which comprises substantially parallel linkage members (19, 34), angled down and backwards, each being pivotally journalled in its upper end to the fork holder, and in the lower end to the fork legs (21), as well as springing and damping mechanisms (39, 41),

characterized in that

- the fork holder encompasses an externally mountable support structure (7, 10, 44) in front of and mostly parallel to the head tube (50), attachable to the head tube (50) by means of rotatable bearings (51, 52) in the upper and lower ends of the head tube, and in that
- the linkage members (19, 34) include

  one upper linkage member (34) positioned centered substantially directly over the bicycle front wheel and supported by horizontal axles (40, 42) in the fork holder and in the upper part of the fork legs (21), respectively, and,

  two lower linkage members (19) positioned outside relative to the front wheel and supported substantially by the fork legs (21) somewhat below the support axle of the upper linkage member.

2. The fork assembly of claim 1,

characterized in that said support structure comprises a main tube (10) encircled above and below by clamp parts (7, 44) each of which being equipped with a projection attachment (8, 23) respectively to the upper and lower head tube bearing (51, 52), and being adjustably attached to the main tube (10) to accommodate for the length of the head tube (50).

3. The fork assembly of claim 2,

characterized in that said upper clamp part (7) is fitted with an adjustable handlebar stem (6), and said lower clamp part (44) is also a top piece of a fork head (12) which in addition to the lower projection (23) includes downward pointing side pieces (43) on each side of the upper part of the vehicle front wheel.

4. The fork assembly of claim 3,

characterized in that said lower linkage members (19) are journalled in their upper/forward end to said downward pointing side pieces (43) of said fork head (12).

5. The fork assembly of claim 1 or 4,

characterized in that the horizontal support axles of said upper linkage member (34) are constituted by an upper (40) and a lower (42) elongate axle bolt.

6. The fork assembly of claim 5,

characterized in that said upper linkage member (34) and its horizontal support axles (40, 42) are constructed as wide as possible within the limitations defined by the fork width and the shape of the fork head (12), to provide a wide and torsionally rigid support.

7. The fork assembly of claim 5,

characterized in that the lower support axle (42) of said upper linkage member (34) has a length substantially the same as that of the distance between the fork legs (21), and that the upper support axle (40) has a maximum length within the dimensions of the fork head (12), to provide a wide and torsionally rigid support.

8. The fork assembly of claim 1,

c h a r a c t e r i z e d i n that teh upper ends of said fork legs (21) are connected by means of a fork bridge (27), and the lower ends of said linkage members (19, 34) are journalled to said fork bridge (27).

9. The fork assembly of claim 1,

c h a r a c t e r i z e d i n that the springing and damping mechanisms include at least one elastic member (41) and at least one damping means (39), both of which being attached in their respective ends to two parts of said fork assembly that are mutually movable in connection with a shock to the fork.

10. The fork assembly of claim 9,

c h a r a c t e r i z e d i n that said spring mechanism is constituted by elastic members (41) and return damping means (39) having their lower ends attached to tabs located in the lower end of each fork bridge side, and their lower ends connected to the sides of said upper linkage member (34).

11. The fork assembly of claim 10,

c h a r a c t e r i z e d i n that each elastic member is constituted by a hilical spring (41) external to a telescopic guide, and that each return damping medium (39) is of a telescopic friction type which at its lower end has an oblong, length-wise opening (57) for joint action with a neck (33) on a tab, to bring about an adjustable, free range of movement without damping.

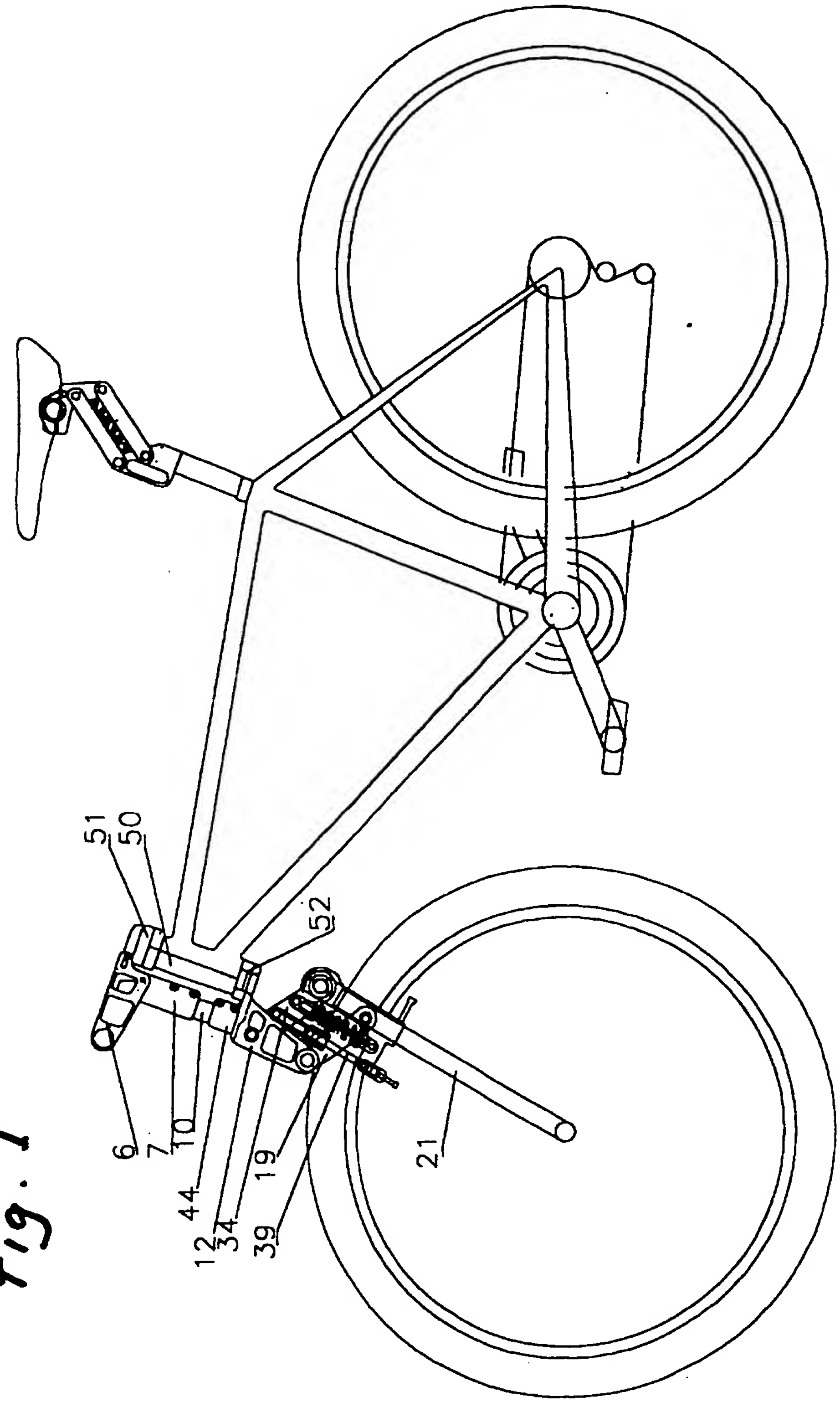

Fig. 1

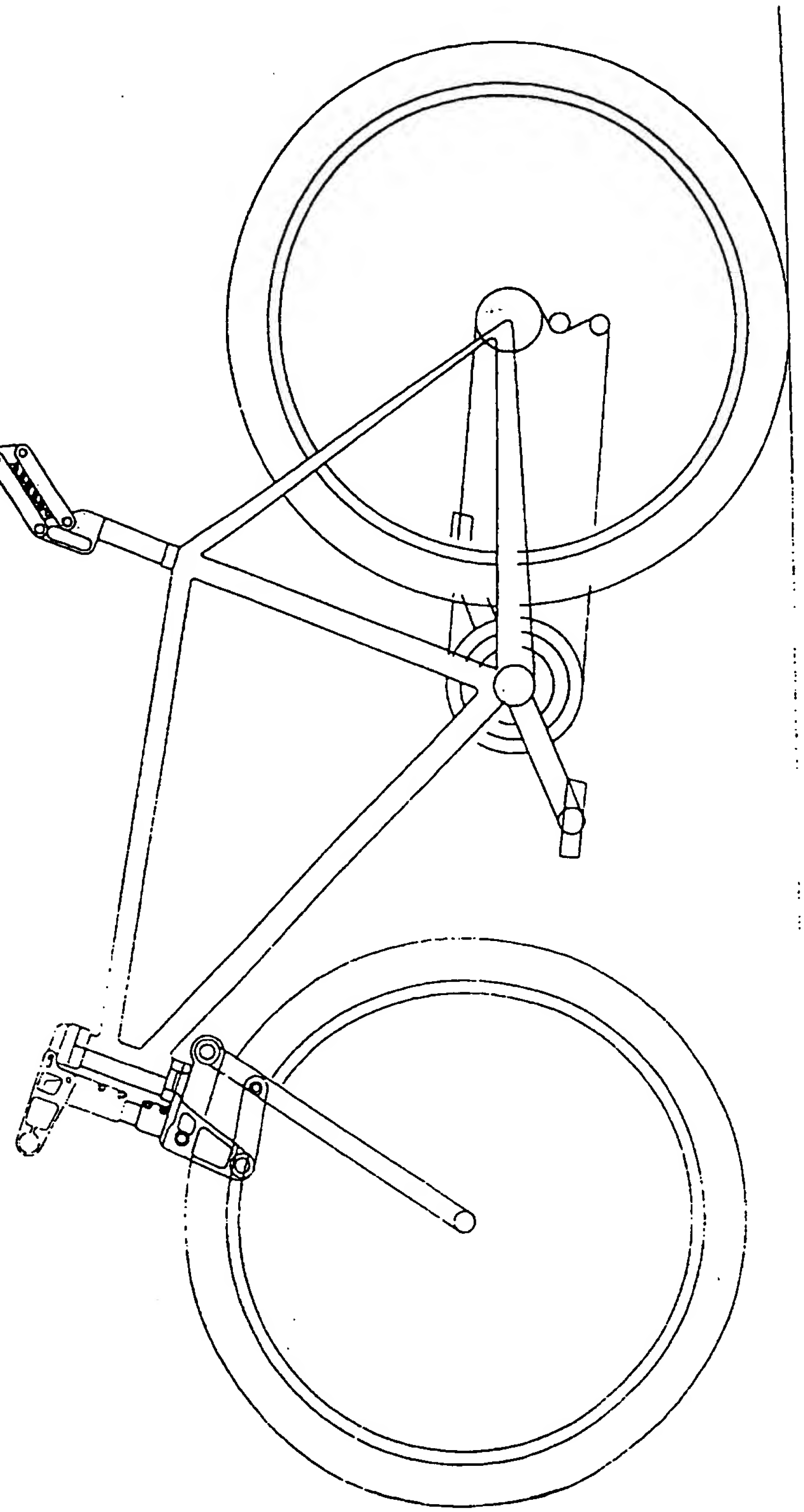

Fig. 2

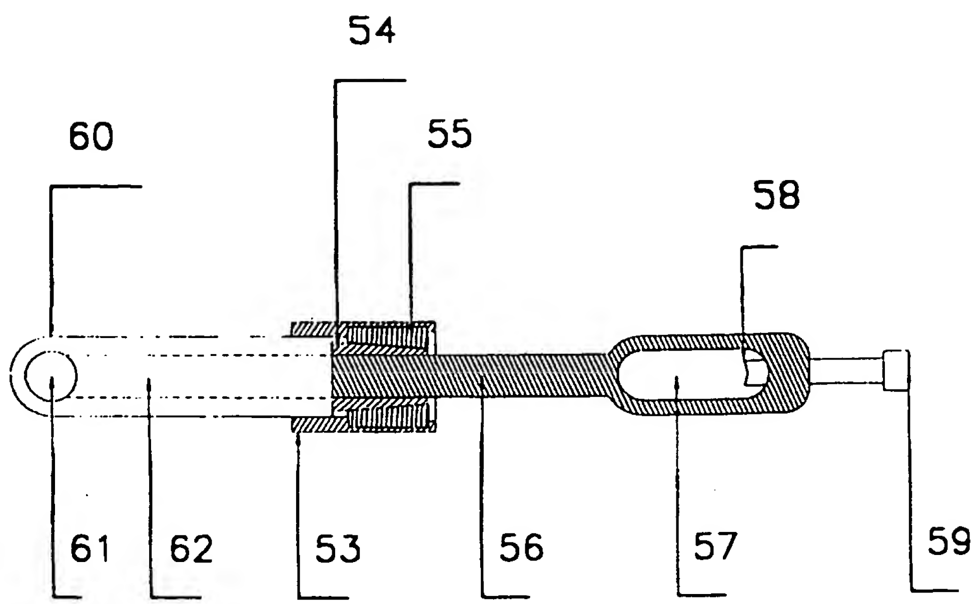

Fig. 3

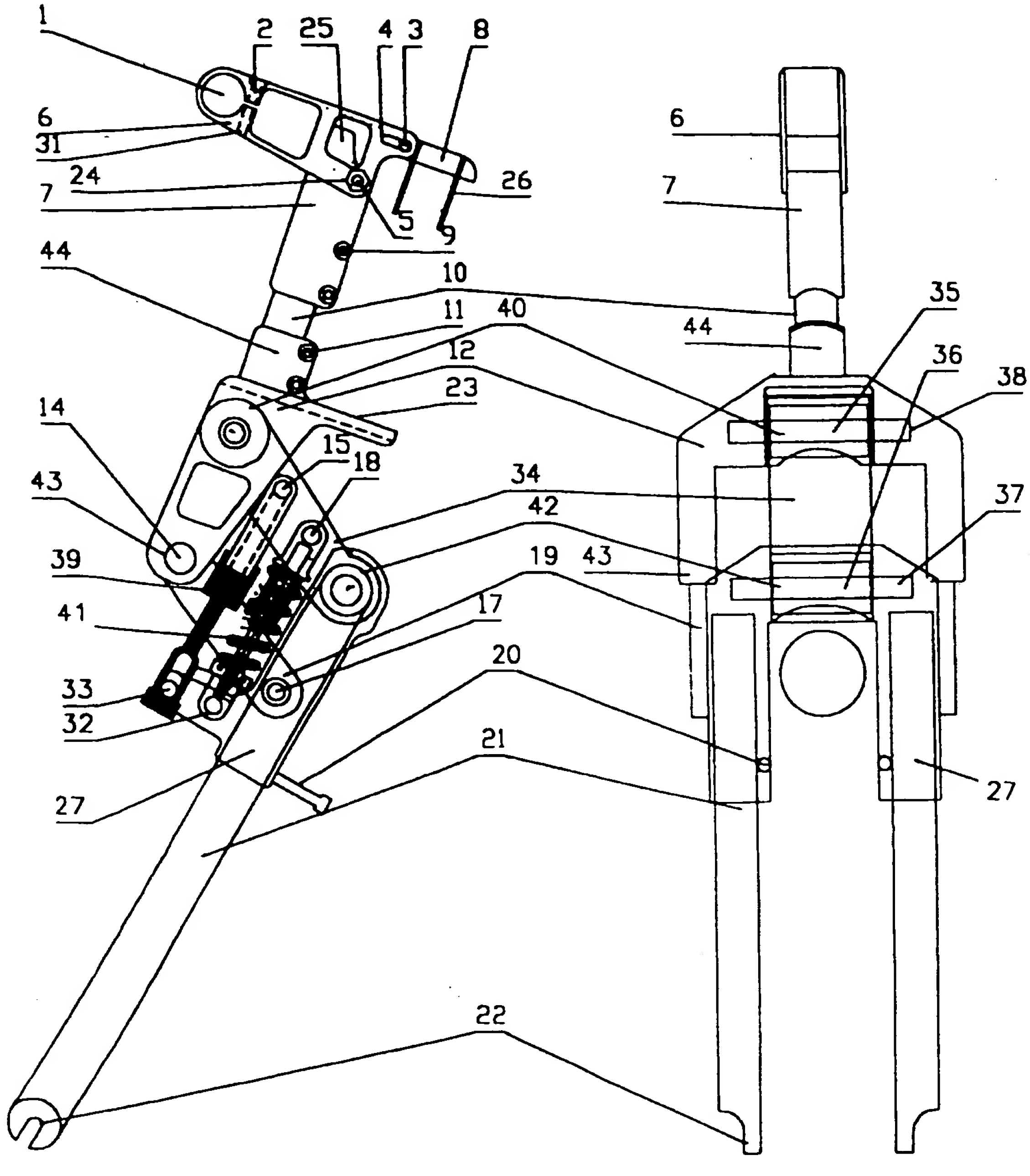
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Fig. 4

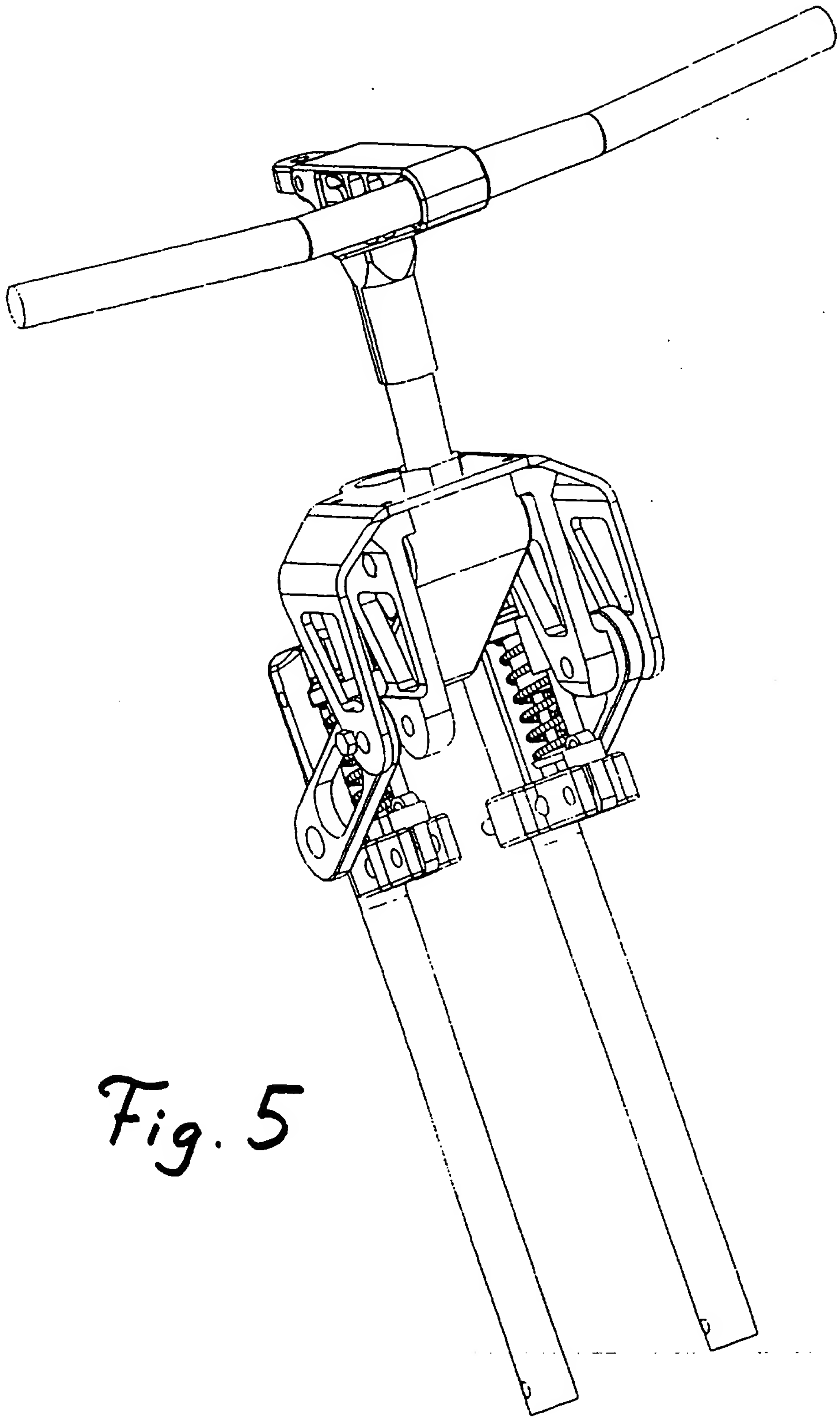

Fig. 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NO 97/00142

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B62K 25/24

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: B62K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0493773 A2 (GALLY, OTTO), 8 July 1992 (08.07.92) --	1-11
A	US 5462302 A (LEITNER), 31 October 1995 (31.10.95) --	1-11
A	DE 3833880 A1 (MICKENBECKER, PETER), 12 April 1990 (12.04.90) -- --------	1-11

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" erlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
8 Sept 1997	09 -09- 1997

Name and mailing address of the ISA/	Authorized officer
Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Göran Carlström Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT
Information on patent family members

06/08/97

International application No.
PCT/NO 97/00142

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0493773 A2	08/07/92	AT 142155 T	15/09/96
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		DE 9116838 U	31/03/94
		DE 59108147 D	00/00/00
		JP 4266580 A	22/09/92
		US 5354085 A	11/10/94
US 5462302 A	31/10/95	NONE	
DE 3833880 A1	12/04/90	NONE	